BNL-75612-2006-AB

ANALYSIS OF AEROSOL INDIRECT EFFECTS IN CALIFORNIA COASTAL STRATUS AND FOG

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For Presentation at the
ARM Science Team Meeting,
Albuquerque, NM
March 27-31, 2006

February 2006

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ABSTRACT

Impacts of aerosol indirect effects are considered too uncertain for inclusion in reports issued by the Intergovernmental Panel on Climate Change. A major reason for this uncertainty is an insufficient physical understanding of crucial cloud microphysical properties and their relationships to pre-cloud aerosol properties and dynamical influences. Direct observations of aerosol indirect effects are sparse because it is difficult to obtain relevant, comprehensive, and statistically significant observational data. This is because other factors that control microphysical structure must be accounted for before indirect effects may be quantified. Data collected over a five-month period using the ARM Mobile Facility deployed at Pt. Reyes, California during the Marine Stratus Radiation, Aerosol, and Drizzle (MASRAD) Experiment provide a relatively unique forum to advance understanding of key microphysical mechanisms associated with aerosol indirect effects. The MASRAD data set contains a comprehensive suite of surface aerosol measurements, including cloud condensation nuclei measurements at multiple supersaturation values, and a comprehensive survey of the cloud properties using surface-based remote sensors, including spectral-recording Doppler Cloud Radar. We present some of our initial analyses of the MASRAD data with the specific goal of linking the measured aerosol properties with the observed cloud microphysical structure, and understanding the regional variability of these microphysical properties using satellite retrievals. We frame our analysis in the context of current parameterizations of aerosol indirect effects with a focus on improving our understanding of their physical underpinning (see poster by Liu et al.).

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